WHAT IS CLAIMED IS:

1. A rotation stabilizing device in a microgravitational rotating apparatus, said microgravitational rotating apparatus comprising a casing, a rotary shaft, provided within said casing, having its both ends supported by bearings so as to be rotationally driven by a motor and a plurality of arms, extending radially, having their one ends fitted and supported to said rotary shaft and the other ends fitted with a plurality of boxes in which objects having weight are placed, wherein said rotation stabilizing device comprises a rotation stabilizing means provided between said casing and said plurality of boxes or between an outer side of said casing and a stationary side or between said rotary shaft and said plurality of arms.

2. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a flat plate ring shape, fixed to outer circumferential surfaces of said plurality of boxes so as to extend orthogonally to said rotary shaft, a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places of a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils

of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair, a gap sensor, detecting variations in said gap, fitted to the wall surface of said casing close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control exciting current of said electromagnetic coils of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

3. A rotation stabilizing device as claimed in Claim 2, wherein said fin, instead of having the flat plate shape, has a frusta-conical shape of which conical surface is inclined with a predetermined angle.

4. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a cylindrical shape, fixed to each of upper and lower surfaces of said plurality of boxes so as to extend in the same direction as said rotary shaft, a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places of a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained

between said fin and said respective electromagnetic coils of the pair, a gap sensor, detecting variations in said gap, fitted to the wall surface of said casing close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control exciting current of said electromagnetic coils of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

5. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a flat plate ring shape, fixed to outer circumferential surfaces of said plurality of boxes so as to extend orthogonally to said rotary shaft, a pair of electromagnetic coils, facing each other, arranged at each of a plurality of places of a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair, a pair of cylinders, fixed to said casing on one hand and connected to said electromagnetic coils of the pair on the other hand so that said electromagnetic coils of the pair may be moved and said gap relative to said fin may be changed, a gap sensor,

detecting variations in said gap, fitted to a wall surface of said casing close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control to drive said cylinders of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said electromagnetic coils of the pair connected to said cylinders may be moved and said gap may fall within said set value.

6. A rotation stabilizing device as claimed in Claim 5, wherein said fin, instead of having the flat plate shape, has a frusta-conical shape of which conical surface is inclined with a predetermined angle.

7. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a cylindrical shape, fixed to each of upper and lower surfaces of said plurality of boxes so as to extend in the same direction as said rotary shaft, a pair of electromagnetic coils, facing each other, arranged at each of a plurality of places of a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair, a pair

of cylinders, fixed to said casing on one hand and connected to said electromagnetic coils of the pair on the other hand so that said electromagnetic coils of the pair may be moved and said gap relative to said fin may be changed, a gap sensor, detecting variations in said gap, fitted to a wall surface of said casing close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control to drive said cylinders of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said electromagnetic coils of the pair connected to said cylinders may be moved and said gap may fall within said set value.

8. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a flat plate ring shape, fixed to an inner circumferential wall surface of said casing so as to extend orthogonally to said rotary shaft, a pair of electromagnetic coils, facing each other, fitted to an outer circumferential surface of each of said plurality of boxes so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair, a gap sensor, detecting

variations in said gap, fitted to the outer circumferential surface of each of said plurality of boxes close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control exciting current of said electromagnetic coils of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

9. A rotation stabilizing device as claimed in Claim 8, wherein said fin, instead of having the flat plate shape, has a frusta-conical shape of which conical surface is inclined with a predetermined angle.

10. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a cylindrical shape, fixed to each of upper and lower inner wall surfaces of said casing so as to extend in the same direction as said rotary shaft, a pair of electromagnetic coils, facing each other, fitted to each of upper and lower surfaces of said plurality of boxes so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair, a gap sensor, detecting variations in said gap, fitted to each of the upper and

lower surfaces of said plurality of boxes close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control exciting current of said electromagnetic coils of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

11. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a flat plate ring shape, fixed to an inner circumferential wall surface of said casing so as to extend orthogonally to said rotary shaft, a pair of cylinders, facing each other, fitted to each of outer circumferential surfaces of said plurality of boxes, a pair of electromagnetic coils, facing each other, connected to said cylinders of the pair so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair as well as so that said gap may be made adjustable, a gap sensor, detecting variations in said gap, fitted to each of the outer circumferential surfaces of said plurality of boxes close to said electromagnetic coils of the pair and a control unit taking detected signals of said gap sensor

and comparing said signals with a set value to thereby control said cylinders of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

12. A rotation stabilizing device as claimed in Claim 11, wherein said fin, instead of having the flat plate shape, has a frusta-conical shape of which conical surface is inclined with a predetermined angle.

13. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means comprises a fin, having a cylindrical shape, fixed to each of upper and lower surfaces of said casing so as to extend in the same direction as said rotary shaft, a pair of cylinders, facing each other, fitted to each of upper and lower surfaces of said plurality of boxes, a pair of electromagnetic coils, facing each other, connected to said cylinders of the pair so that said fin may be interposed between said electromagnetic coils of the pair with a predetermined gap being maintained between said fin and said respective electromagnetic coils of the pair as well as so that said gap may be made adjustable, a gap sensor, detecting variations in said gap, fitted to each of the upper and lower surfaces of said plurality of boxes close to said electromagnetic coils of the pair and a control

Page 95 of 98

unit taking detected signals of said gap sensor and comparing said signals with a set value to thereby control said cylinders of the pair existing at the position corresponding to said gap sensor that detected said signals in excess of said set value so that said gap may fall within said set value.

14. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means is a vibration isolating device supporting said casing at each of a plurality of places of an outer peripheral portion of said casing and said vibration isolating device comprises a spring mechanism elastically supporting said casing to a stationary side member and an electromagnetically supporting mechanism comprising an exciting coil connected to said spring mechanism to electromagnetically support said spring mechanism to said stationary side member by exciting said exciting coil.

15. A rotation stabilizing device as claimed in Claim 14, wherein said vibration isolating device further comprises a gap sensor detecting a gap between said casing and said stationary side member and a control unit taking detected signals of said gap sensor and, in case of detection of said gap in excess of a predetermined range, controlling exciting current of said exciting coil so as to reduce vibration.

16. A rotation stabilizing device as claimed in Claim 14, wherein said vibration isolating device further comprises a gap sensor detecting a gap between said casing and said stationary side member and a control unit taking detected signals of said gap sensor to detect signal variations and putting out such drive signals as to cancel said signal variations so that exciting current of said exciting coil may be controlled by said drive signals to thereby control to reduce vibration.

17. A rotation stabilizing device as claimed in any of Claims 14 to 16, wherein said spring mechanism comprises a casing side frame member fitted to said casing, a stationary side frame member fitted to said stationary side member and a spring connecting said casing side frame member and said stationary side frame member and said electromagnetically supporting mechanism has said exciting coil fitted to said casing side frame member and comprises a conductor fitted to said stationary side frame member so as to be inserted into said casing side frame member with a predetermined gap being maintained between said conductor and said casing side frame member.

18. A rotation stabilizing device as claimed in any of Claims 14 to 17, wherein said spring mechanism uses one or more bar-like rod springs.

19. A rotation stabilizing device as claimed in

any of Claims 14 to 17, wherein said spring mechanism uses one or more bar-like coil springs.

20. A rotation stabilizing device as claimed in any of Claims 14 to 17, wherein said spring mechanism uses one or more members made of rubber, plastics, etc. having a predetermined elasticity.

21. A rotation stabilizing device as claimed in Claim 1, wherein said rotation stabilizing means is a safety device interposed between said rotary shaft and said plurality of arms and, if said rotary shaft stops suddenly, said safety device disconnects said rotary shaft and said plurality of arms from each other so that said plurality of arms may rotate freely from said rotary shaft.

22. A rotation stabilizing device as claimed in Claim 21, wherein said safety device comprises an actuator fitted within each of said plurality of arms, a pin fitted to an end of a rod of said actuator and a sensor detecting a rotation of said rotary shaft and, when said rod of said actuator elongates to thereby cause said pin of the rod end to engage with a pin hole provided in said rotary shaft, said plurality of arms become rotatable together with said rotary shaft and, if said rotary shaft stops suddenly, said rod is retracted, based on a signal from said sensor, to thereby disengage said pin from said pin hole.

23. A rotation stabilizing device as claimed in

Claim 21, wherein said plurality of arms are radially fixed to a connecting shaft, said rotary shaft is separated to an upper rotary shaft and a lower rotary shaft so that said connecting shaft is interposed therebetween, there are provided an actuator fitted within each of said upper and lower rotary shafts, a pin fitted to an end of a rod of said actuator and a sensor detecting a rotation of said rotary shaft and, when said rod of said actuator elongates to thereby cause said pin of the rod end to engage with a pin hole provided in said connecting shaft, said connecting shaft becomes rotatable together with said rotary shaft and, if said rotary shaft stops suddenly, said rod is retracted, based on a signal from said sensor, to thereby disengage said pin from said pin hole.

24. A rotation stabilizing device as claimed in Claim 21, wherein said safety device comprises an actuator, having a rod of which end is formed in a round shape, fitted within each of said plurality of arms, a sensor detecting a rotation of said rotary shaft and an abutting portion, having a recessed round shape that is complementary to the round shape of the rod end of said actuator, provided in said rotary shaft so that the rod end of said actuator may be moved to abut on said abutting portion and, when said rod of said actuator elongates to thereby cause the rod end to abut on said abutting portion of said rotary shaft,

said plurality of arms become rotatable together with said rotary shaft and, if said rotary shaft stops suddenly, said rod is retracted, based on a signal from said sensor, to thereby disengage the rod end from said abutting portion.

25. A rotation stabilizing device as claimed in Claim 21, wherein said safety device comprises a hole provided in each of said plurality of arms so as to open at an end face thereof, a spring provided at a bottom of said hole, a claw member having its one end activated by said spring and the other end projecting outside said hole and an abutting portion, having a recessed shape that is complementary to a shape of the projecting end of said claw member, provided in said rotary shaft so that the projecting end of said claw member activated by said spring may abut on said abutting portion of said rotary shaft and thereby said plurality of arms are rotatable together with said rotary shaft and, if said rotary shaft stops suddenly, said plurality of arms together with said claw member continue to rotate by inertia force so as to make said claw member disengageable from said abutting portion of said rotary shaft and thereby said plurality of arms are made rotatable freely from said rotary shaft.